



Harmful Algal Bloom (HAB): Lady Bird Lake



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Watershed Protection Department

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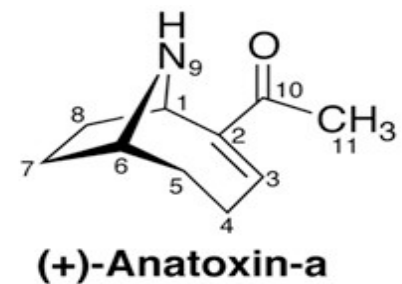
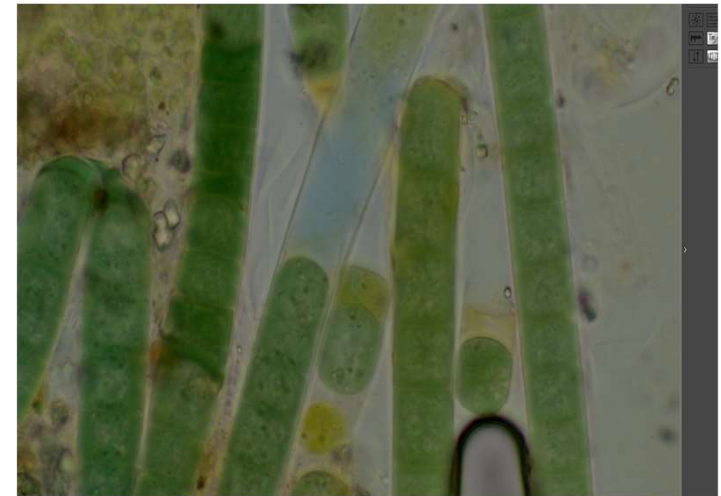
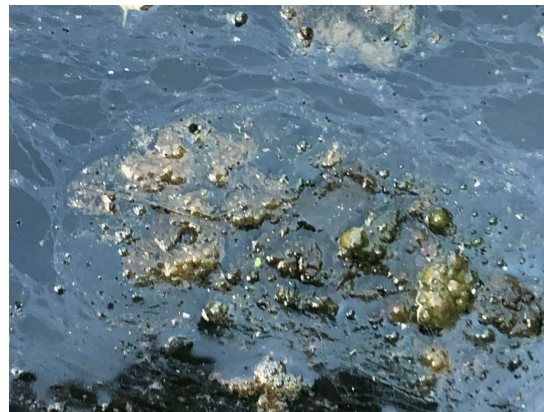
What Happened in 2019?



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Dog deaths at Red Bud and Auditorium shores

Only observed in Lady Bird (no mortalities reported in 2020)





HAB types

**Planktonic (single
cells in water column)
– Most Common**

Lake Erie, Des Moines

**Cohesive mats
(benthic, floating
matrix of filaments)**

Lady Bird Lake



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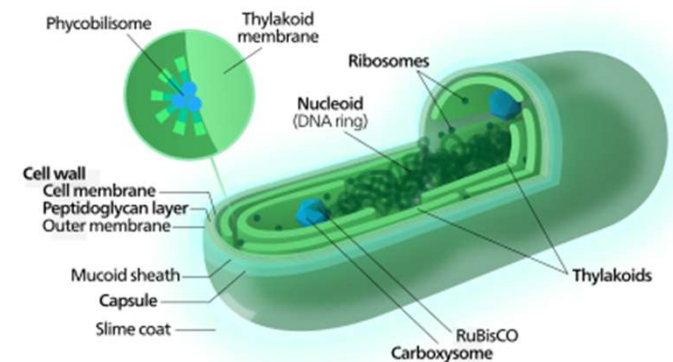
Cyanobacteria

Primitive!

- Over 3 *billion* years old
- First photosynthetic organisms; changed Earth's atmosphere – the “Great Oxygenation Event”
- 6,000+ estimated species

Capable of producing secondary metabolites

- Geosmin, 2-methylisoborneol (MIB) – linked to taste-and-odor issues in the drinking water
- Toxins



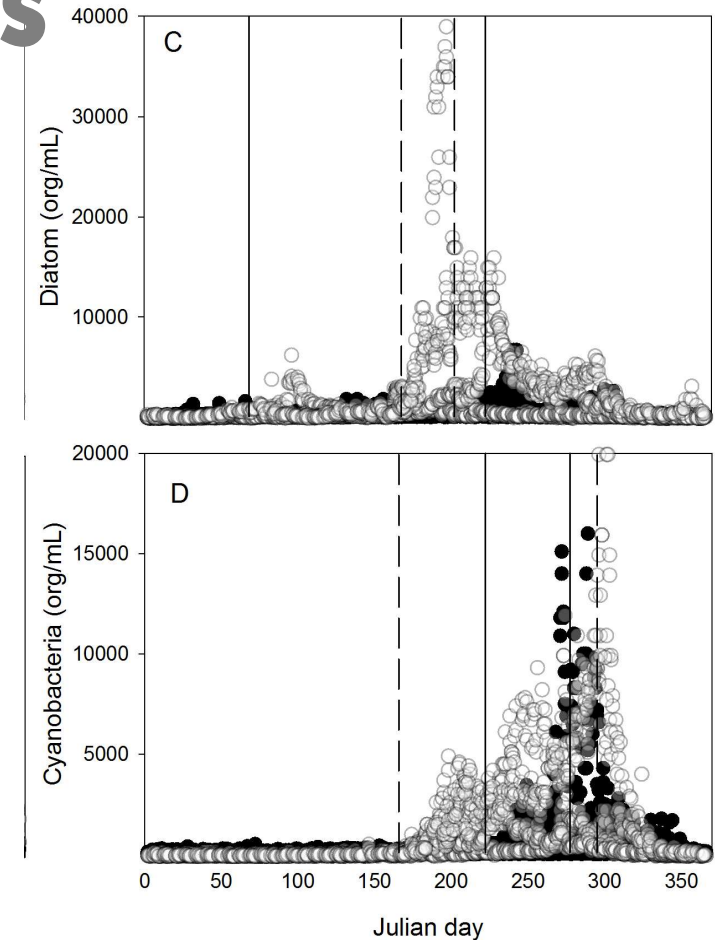


Cyano. Pop. Dynamics

Seasonality typical (summer)
(Data from Lake Austin)

“Three pillars” to a toxic bloom

- Low flows, lack of rain, minimal turbulence
- Hot
- Abundant Nutrients (N, P)

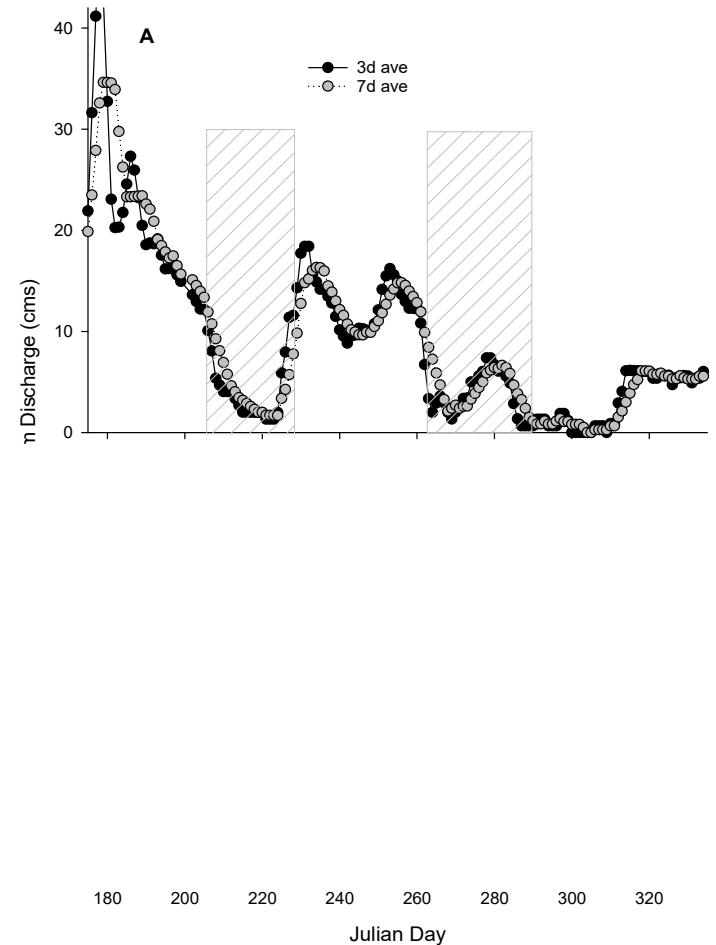




The 2019 LBL Event

Discharge rates

- Late July drop in discharge coincided with bloom and toxins event

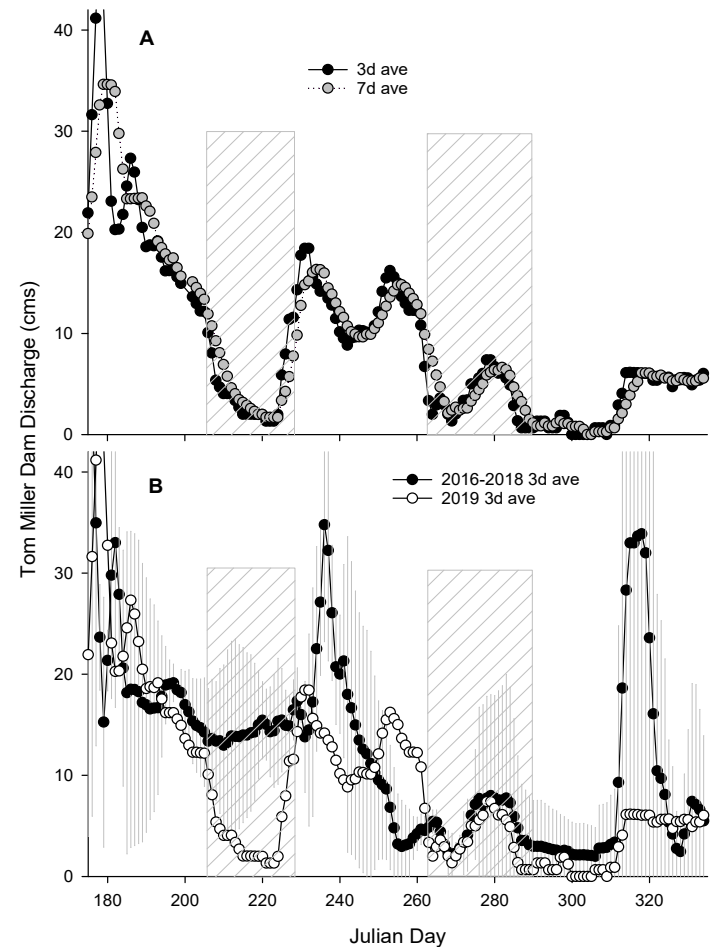




The 2019 LBL Event

Discharge rates

- Late July drop in discharge coincided with bloom and toxins event
- Ave was lower than previous 3-year period





The 2019 LBL Event



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Water Temps

- $>30^{\circ}\text{C}$ weekend of dog deaths

Nutrients

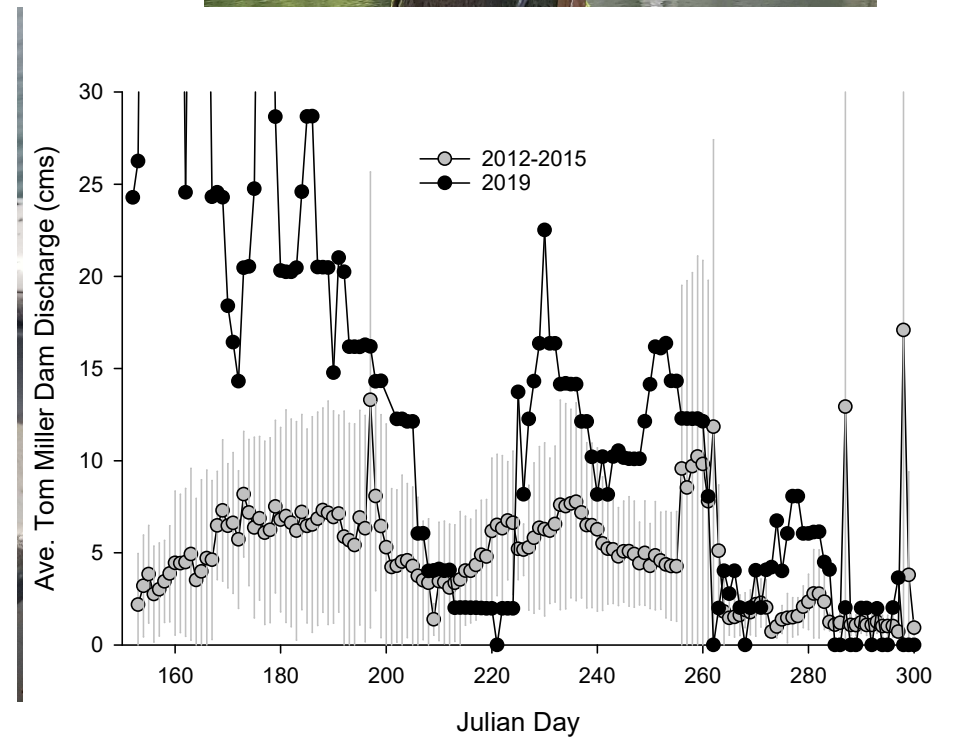
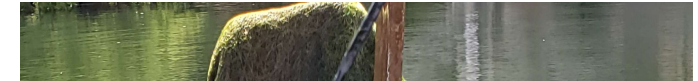
- Significantly higher NH_3 , NO_x in 2019 and abundant TP at sites where HAB/dog deaths occurred
- Elevated compared to previous years (based on routine monitoring)

Period	Project	NH_3 ($\mu\text{g/L}$)	NO_x ($\mu\text{g/L}$)	TP ($\mu\text{g/L}$)
2019	Bloom	32.5 ± 16.9	253.1 ± 181.4	21.9 ± 15.0
2016 – 2018	Monitoring	8.0 ± 0.0	199.0 ± 198.0	14.1 ± 9.3
2019	Monitoring	19.1 ± 18.2	476.0 ± 488.0	26.4 ± 15.5



What Made 2019 Different?

- Zebra mussels (new)
 - Alter water chemistry
 - Promote dense benthic growth
- Large flooding, runoff, depositional event (Fall 2018) (new)
 - Altered sediment and water chemistry?
- Climate change (new)
- Dog waste (old)
- (sorta) Low flows (old)
 - But now coupled with new drivers!





Forecasting and Prevention (?)

“HABs cannot easily be eliminated or prevented, but they can be monitored and predicted, and the potentially negative consequences can be managed and mitigated. Changes in human activities and behaviour could also contribute to prevent or minimize certain HABs and their deleterious effects.” Kudela et al. (2015) IOC/UNESCO Report

WPD Approach to Monitoring, Modeling, Mitigation

- Weekly WQ sampling; Daily Discharges; Hourly Temps; Toxin abundances; Species Library (DNA fingerprinting)
 - Developing Models
- Treatment and preventative options being explored
 - Aeration
 - Alum
 - Biochar
 - Physical or Mechanical Removal
 - Chemicals (absolute last resort)

Unclear how effective any of these treatments would be in reservoir



Questions?

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CITY OF AUSTIN WATERSHED PROTECTION DEPARTMENT